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PATENT ABSTRACTS OF JAPAN

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(71)Applicant : CANON INC

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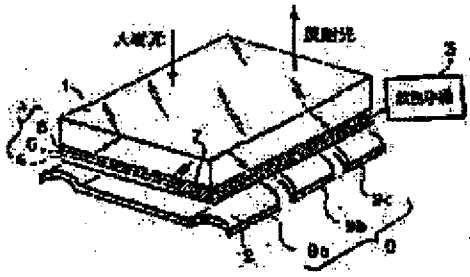
(54) PROJECTION OPTICAL SYSTEM USING INTERFEROMETRIC MODULATION DEVICE



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PROBLEM TO BE SOLVED: To provide a light image projection system in which an intereferometric modulation(IMOD) device with reduced heat generation is employed.

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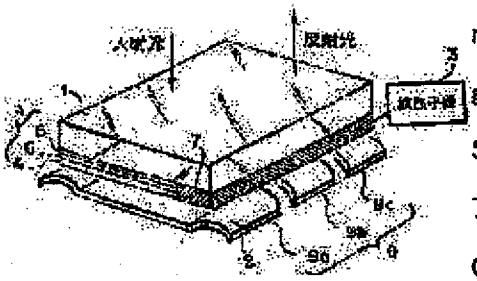

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CLAIMS

[Claim(s)]

[Claim 1]A coherence modulation element which is a coherence modulation element which performs light modulation using interference, and is characterized by having a radiation means.

[Claim 2]A coherence modulation element which is a coherence modulation element

which confronted a light incidence part which has the optical resonance layer which laminated two or more layers which consist of combination of a dielectric layer and a metal layer on a transparent substrate, and a moving reflector, and is characterized by arranging a heat transfer body to said coherence modulation element.

[Claim 3]The coherence modulation element according to claim 2 confronting said light incidence part and said moving reflector via an air layer.

[Claim 4]The IMOD element according to claim 2, wherein said heat transfer body touches said metal layer at least.

[Claim 5]An image display element arranging said coherence modulation element indicated to any one of the claims 1 thru/or 4 to one dimension.

[Claim 6]An image display device which is provided with the following, illuminates said image display element by pupil division of said projection optical system, and is characterized by obtaining a two-dimensional projection image by scanning by said scanning means.

The image display element according to claim 5.

A projection optical system which projects an image display element.

A scanning means which said projection optical system extracted and has been arranged in the neighborhood.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which an invention belongs] This invention relates to the bright image display device using the IMOD element and it which controlled generation of heat especially about the image display device which used coherence abnormal conditions (Interferometric Modulation:IMOD) and it.

[0002]

[Description of the Prior Art]The image display element which modulates light using the

interferential action of light The ** table No. 500245 [2000 to] gazette, the Patent Publication Heisei No. 500224 [ten to] gazette, and Digital Paper:Reflective Display Using Interferomtric Modulation: (M. W.Miles, SID'00) etc. -- it is indicated. These realize the coherence abnormal-conditions (IMOD) element which compounds the resonant action of the light looked at by art, a Fabry-Perot interferometer, etc. of MEMS (micro electric mechanical system), and modulates light. A figure is used for below and a principle is briefly explained to it. Drawing 8 shows the outline of an optical modulator and the antenna reflector 100 is arranged against the derivation absorber 105 which contains the films 104, 106, and 108 via the spacer 102.

The incidence medium 110 is in contact with the derivation absorber 105 on boundary of one of the two.

As shown in the figure, very easy composition is carried out. It enters from the incidence medium 110, and is reflected by the antenna reflector 100, and light has composition which is ejected from the incidence medium 100. An optical property can be changed by the interval T of the antenna reflector 100 and the derivation absorber 105 serving as variable, and changing this interval.

[0003]Using as a zirconium dioxide, tungsten, and diacid-ized silicon the films 104, 106, and 108 which constitute the derivation absorber 105 is indicated. The MEMS (micro electric mechanical system) structure which comprises the dielectric film and metal membrane like drawing 7 as a structure for changing the interval T is adopted. A reflector is driven at very high speed with static electricity, and can perform light modulation. Drawing 9 to drawing 12 is change of an optical property in case intervals with a spacer differ. A vertical axis is reflectance and each figure is [a horizontal axis] wavelength. Drawing 9 is an optical property shown when it is the value Tblack with the interval of a spacer.

As shown in the figure, reflectance is in a low state over a light region at large.

In this case, "black" is displayed. Drawing 10-drawing 12 is the characteristic in case the interval T is a certain value, respectively.

They are the intervals TB, TG, and TR which can display blue, green, and red, respectively.

According to an example of a dielectric absorption object, it is TG>TB> TR>Tblack. A picture in color can be displayed by arranging such a structure in two dimensions and controlling it. Electrostatic force is used for the drive of the antenna reflector 100, for example. For this reason, very high-speed operation can be performed. In expression of the story tonality of image display, the gray scale representation of the area gradation which changes the rate of the pixel of the state where the reflectance in a certain area is high, or the time sharing using the ability to operate at high speed can be used.

[0004]

[Problem(s) to be Solved by the Invention]However, if it is going to acquire a bright picture when illuminating appropriately the coherence abnormal-conditions (IMOD) element mentioned above with a certain light source and forming the picture on a screen, since the big absorption of light at the time of a black display happens, generation of heat of the display device itself will pose a problem.

[0005]Then, this invention makes it the technical problem to use the IMOD element and to provide an image projection device with high luminosity while reducing generation of heat of an IMOD element.

[0006]

[Means for Solving the Problem]An IMOD element of this invention for solving the above-mentioned technical problem is a coherence abnormal-conditions (IMOD) element which confronted a light incidence part containing an insulation layer and an optical resonance layer which laminated a metal layer on two or more transparent substrates, and a moving reflector, and arranges a heat transfer body for said IMOD element.

[0007]Heat comes to radiate heat for an IMOD element by this, and problems, such as breakage, are reduced. In order to establish structure for radiating heat, since aperture efficiency falls, an IMOD element is made into structure which displays a one-dimensional picture.

[0008]In addition, in order to acquire a two-dimensional picture, a means for scanning at right angles to a one-dimensional picture optically is formed.

[0009]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described

with reference to drawings.

[0010]Drawing 1 shows the main structures near [one] the pixel structure of the IMOD element of the 1st operation xenomorphic voice. As a actual element, it will have a majority of this structure. 1 expresses base glass and incident light penetrates this base glass. 4, 6, and 8 are the thin films of a dielectric or metal, respectively, and the resonance layer 5 of light is formed by choosing such thickness appropriately.

[0011]2 is an antenna reflector and the interval T of a resonance layer and the antenna reflector 2 changes to the driving mechanism which is not illustrated. By changing this T, it is possible for the characteristic of the absorption of light and reflection to change, to modulate light, and to display a picture. Catoptric light is ejected from the glass substrate 1 to incident light and reverse. If the interval T is controlled and light is made to absorb, reflectance will become low and will come to display "black" as a picture. Since the absorption of light happens at this time, an element generates heat. When illuminating an element positively and acquiring a bright picture especially, this heat poses a problem greatly. For this reason, the heat transfer body 7 which is easy to conduct the heat of the resonance layer 5 of light is formed in the side of the resonance layer 5. The radiation means 3 and this heat transfer body 7 of the display which furthermore is not illustrated are connected mechanically.

[0012]This structure enables it to suppress the rise in heat of an IMOD element, even if heat occurs.

[0013]If metaled conductivity is good about the heat transfer body 7, the same effect will be acquired and it will not limit in particular for the kind. The heat transfer body 7 should just mainly touch conduction layers, such as metal in the resonance layer 5.

[0014]having heat resistance about the base glass 1 -- **** -- better -- **.

[0015]Another aspect of this operation xenomorphic voice is shown in drawing 2. As a thing showing the same function, the thing of the same numerals omits explanation. Although a certain pixel structure was shown about drawing 1, in drawing 2, the base glass 1 and the heat transfer body 7 are attached in common to each pixels 9a, 9b, and 9c. By this, substrate structure becomes simple.

[0016]Although the aperture efficiency in a display device is falling by having arranged

the heat transfer body 7 on the side of the resonance layer 5 fundamentally, decline in aperture efficiency can be suppressed by having considered it as one-dimensional structure. It becomes possible [the circuit for the drive of each pixel, etc.] to arrange on the side of pixel structure.

[0017]In this operation xenomorphic voice, although the case where the heat transfer body 7 was arranged to the one resonance layer 5 was shown, it does not limit to this. For example, when performing area gradation, a common heat transfer body may be provided to the resonance layer 5 of the area simultaneously driven as one certain pixel.

[0018]Next, the 2nd operation xenomorphic voice is explained.

[0019]Drawing 3 carries out one-dimensional array of the IMOD element which has the heat transfer body 7, and shows the composition of the projected type display equipment which can obtain a two-dimensional big screen. This projection device acquires a two-dimensional picture by scanning the picture of the IMOD element 10 which has a pixel row to a space perpendicular direction in the direction which carries out extended projection and intersects perpendicularly with a pixel row on the screen 12.

[0020]The illumination-light study system 14 comprises a light source, a light volume equalization means, etc., and forms a light source image near the scanning means 13. The illumination light illuminates an IMOD element [abbreviated] via a part of projection optical system 11 11a. The light from an IMOD element strikes upon the scanning means 13a via the optical system 11a. The light-scanning means 13a is constituted so that it may reflect about the light from an IMOD element, and it has the work which deflects an optical path to the direction of the screen 12. Image formation of the image of a projection optical system which is already an IMOD element via 11b in part is carried out on a screen. The light-scanning means 13 has the axis of rotation in the pixel row of an IMOD element, and parallel, and can be rotated. A screen top can be scanned by this and a two-dimensional picture can be acquired as a result. A heat transfer body is provided in IMOD10 and the heat transfer body is connected with the radiation means 3 of the device. Thereby, even if the light from the illumination-light study system 14 is absorbed with the IMOD element 10, it becomes possible to make a rise in heat low.

[0021]Next, the composition of the illumination-light study system 14, and the IMOD

element 10 and the optical system 11a is explained.

[0022]Drawing 4 shows the outline of the section from a vertical direction to the pixel row. The IMOD element 10 has a pixel row in space.

[0023]The light from the illumination-light study system 14 forms the light source image 15a near the light-scanning means 13, as mentioned above. The position of this light source image 15a is near the front side focal plane of the optical system 11a to the section of this figure, and illuminates the IMOD element 10 by an abbreviated parallel beam in the section of drawing 4. Since it has offset to the optical system 11a, the position of the light source image 15a is constituted to the IMOD element so that it may enter aslant. The catoptric light from the IMOD element 10 forms a light source image in the position of 15b which changed in 15a with these composition again.

[0024]It is a symmetric position optically in the composition of an optical system to the light source image 15a. This 2nd light source image 15b will be scanned by the light-scanning means 13.

[0025]Drawing 5 shows the composition of the light-scanning means 13a. As shown in drawing 4, the light from the illumination-light study system 14 penetrates, and it is necessary to reflect the light from the IMOD element 10 in order to scan. Therefore, the field reflected in order that the light-scanning means may be divided into the two fields 13R and 13T and 13R may scan light, and 13T are a penetration or a cave, and pass.

[0026]To the projection optical system 11, near the pupil, the light-scanning means 13 is formed and is, by constituting the scanning means 13 like drawing 5, pupil division can be carried out and the optical path of lighting and projection can be separated. It is possible to display a color picture by illuminating according to white light and changing the characteristic of an IMOD element at high speed. About story tonality, it may carry out by area gradation, and it is driving a pixel at a high speed more, and may carry out by time sharing. Drawing 6 is another aspect of this operation xenomorphic voice. Explanation is omitted as a thing showing the function that the thing of the same numerals is the same. By drawing 6, 16 is color composition separating mechanism, for example, a dichroic prism is used.

[0027]The white light emitted from the illumination-light study system 14 is separated by

the color composition separating optical system 16 so that it may correspond to the IMOD elements 10a, 10b, and 10c which perform light modulation for every wavelength area for every wavelength area via the optical system 11a. The light from each IMOD elements 10a, 10b, and 10c is compounded by the color separation synthetic light study system 16, has the screen 12 top scanned via the light-scanning means 13, and displays a two-dimensional color picture. About a color separation synthetic light study system and the characteristic of a light source, and a kind, each publicly known thing is used suitably. To the picture signal which should be displayed, a synchronization is taken, and the scanning means 13 and each IMOD element are electrically controlled so that a desired picture is acquired. every used for a two-dimensional colored presentation -- since the heat transfer body 7 is formed and the radiation means 3 is further connected so that the IMOD element can radiate heat in the heat generated with powerful lighting, even if a bright picture can be displayed on a screen and it uses it for a long time, degradation of an IMOD element is small. In this invention, although the light source was made into the white light source, two or more monochromatic light sources may be combined.

[0028]

[Effect of the Invention]According to this invention explained above, a rise in heat can be reduced by arranging a heat transfer body and a radiation means for a coherence abnormal-conditions (IMOD) element. A projection type display is realizable with the IMOD element of one-dimensional array which has a heat transfer body on the side.

TECHNICAL FIELD

[A technical field to which an invention belongs] This invention relates to a bright image display device using an IMOD element and it which controlled generation of heat especially about an image display device which used coherence abnormal conditions (Interferometric Modulation:IMOD) and it.

PRIOR ART

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even if a bright picture can be displayed on a screen and it uses it for a long time, degradation of an IMOD element is small. In this invention, although the light source was made into the white light source, two or more monochromatic light sources may be combined.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The schematic diagram of the 1st operation xenomorphic voice concerning this invention

[Drawing 2]The schematic diagram of another aspect of the 1st operation xenomorphic voice concerning this invention

[Drawing 3]The lineblock diagram of the 2nd operation xenomorphic voice concerning this invention

[Drawing 4]The lineblock diagram of an illumination-light study system of the 2nd operation xenomorphic voice

[Drawing 5]The lineblock diagram of a scanning means

[Drawing 6]Another aspect of the 2nd operation xenomorphic voice

[Drawing 7]The lineblock diagram of an interference pattern reflection type display

[Drawing 8]The lineblock diagram of an antenna reflector

[Drawing 9]The characteristic of an interference pattern reflection type display

[Drawing 10]The characteristic of an interference pattern reflection type display

[Drawing 11]The characteristic of an interference pattern reflection type display

[Drawing 12]The characteristic of an interference pattern reflection type display

[Description of Notations]

1 Base glass

2 Antenna reflector

3 Radiation means

4 Thin film

5 Optical resonance layer

6 Thin film

7 Heat transfer body part

8 Thin film

9 Pixel

10 The coherence abnormal-conditions (IMOD) element of one-dimensional array

11 Projection optical system

12 Screen

13 Scanning means

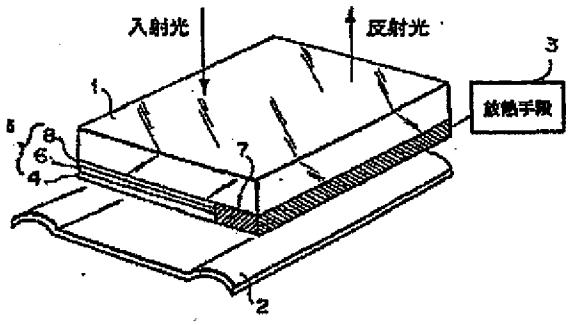
14 Illumination-light study system

15 Light source image

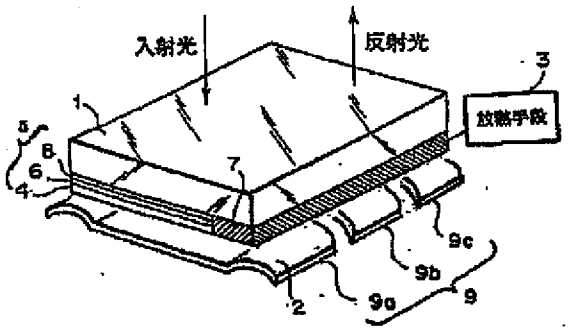
16 Color composition separating mechanism

DRAWINGS

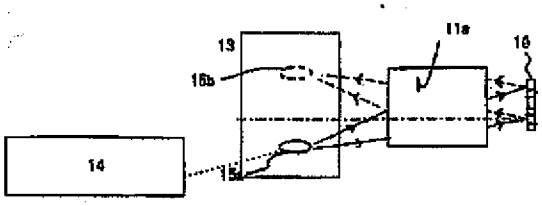
[Drawing 1]



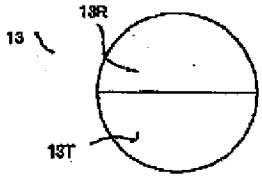
[Drawing 2]



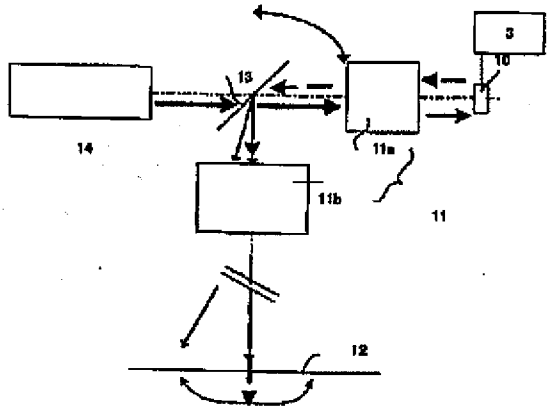
[Drawing 4]



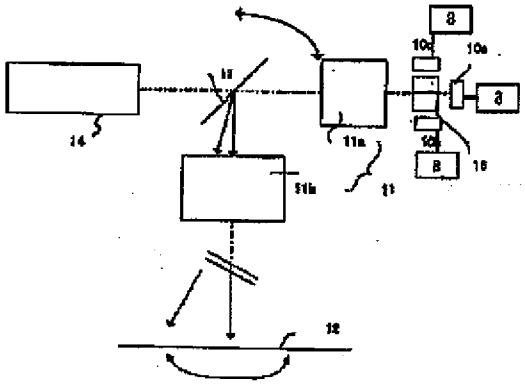
[Drawing 5]



[Drawing 3]



[Drawing 6]



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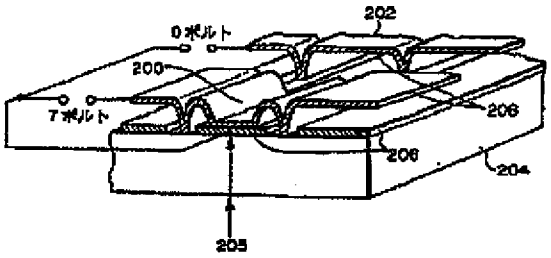

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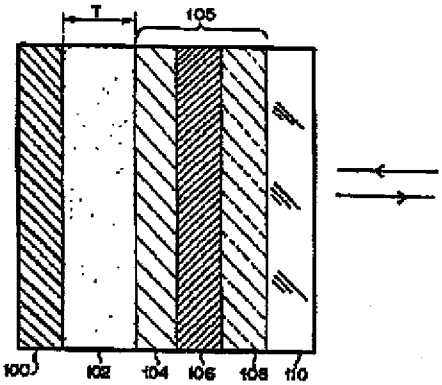

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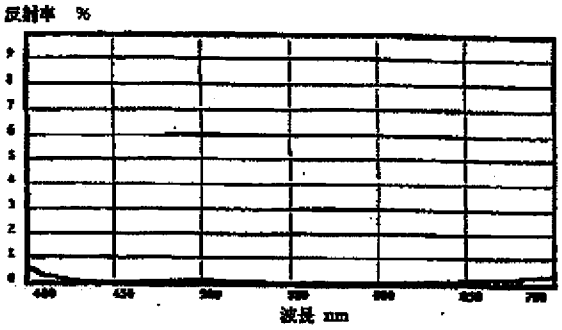

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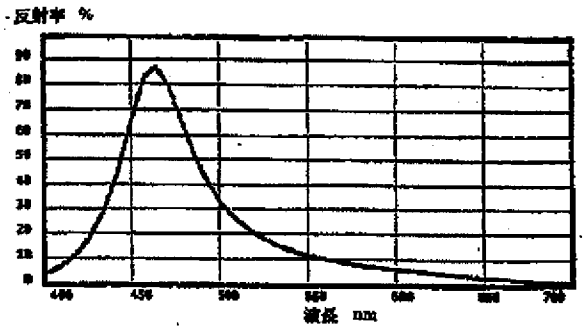

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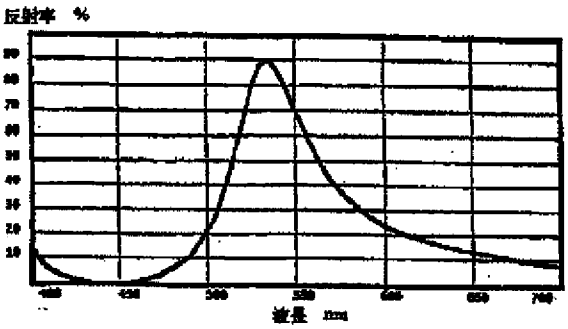

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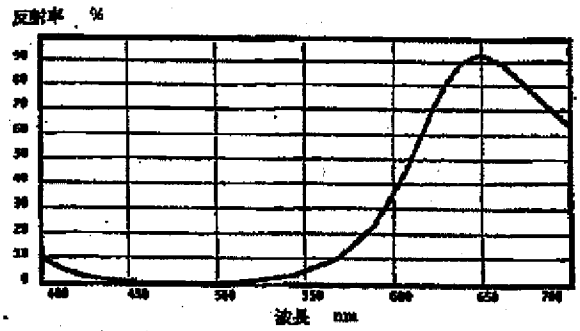

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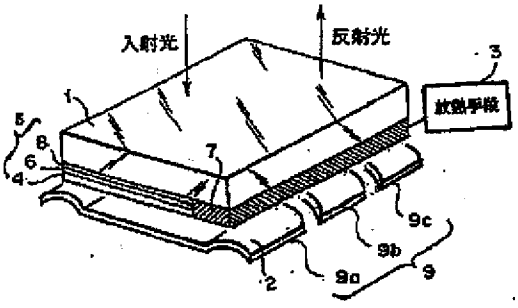
(54)【発明の名称】　干渉性変調素子を用いた投影光学系

(57)【要約】
【課題】　干渉性変調（ＩＭＯＤ）素子の発熱を低減するとともに、そのＩＭＯＤ素子を使用して、明るい画像投影装置を提供する。
【解決手段】　基板ガラス１や伝熱体７が、各画素９ａ、９ｂ、９ｃに対して共通に取り付けられている。これによって、基板構造が簡素化される。伝熱体７を共振層５の側面に配置したことにより、表示素子における開口効率は低下しているが、１次元構造としたことにより、開口効率の低下を抑えることができる。また、各画素の駆動用の回路なども、共振層５の側面に配置することが可能となる。



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【特許請求の範囲】

【請求項１】　干渉を利用して光変調を行う干渉性変調素子であって、放熱手段を有することを特徴とする干渉性変調素子。

【請求項２】　誘電体層と金属層の組み合わせからなる複数の層を透明基板上に積層した光共振層を有する光入射部と、可動反射鏡とを、対峙させた干渉性変調素子であって、前記干渉性変調素子に伝熱体を配置することを特徴とする干渉性変調素子。

【請求項３】　前記光入射部と、前記可動反射鏡とを、空気層を介して対峙させたことを特徴とする請求項２記載の干渉性変調素子。

【請求項４】　前記伝熱体は、少なくとも前記金属層に接触していることを特徴とする請求項２記載のIMOD素子。

【請求項５】　請求項１乃至４のいずれか一つに記載された前記干渉性変調素子を１次元に配列することを特徴とする画像表示素子。

【請求項６】　請求項５記載の画像表示素子と、
画像表示素子を投射する投射光学系と、
前記投射光学系のしぼり近傍に配置された走査手段とを備え、
前記画像表示素子を前記投射光学系の瞳分割により照明し、
前記走査手段により走査することで２次元の投射画像を得ることを特徴とする画像表示装置。

【発明の詳細な説明】

【０００１】

【発明が属する技術分野】本発明は、干渉性変調（Interferometric Modulation：IMOD）及びそれを用いた画像表示装置に関し、特に、発熱を抑制したIMOD素子及びそれを用いた明るい画像表示装置に関する。

【０００２】

【従来の技術】光の干渉作用を利用して光の変調を行う画像表示素子が、特表2000－500245号公報、特表平10－500224号公報、Digital Paper:Reflective Display Using Interferomtric Modulation: (M.W.Miles, SID '00)などにより開示されている。これらは、MEMS(micro electric mechanical system)の技術とファブリ・ペロー干渉計などに見られる光の共振作用とを複合して光を変調する干渉性変調（IMOD)素子を実現するものである。以下に図を用いて原理を簡単に説明する。図８は、光変調器の概要を示したものであり、反射器100は、スペーサ102を介して膜104、106、108を含む誘導吸収体105と対抗して配置されており、入射媒体110は誘導吸収体105と片方の境界で接している。同図に示したように、非常に簡単な構成をしている。光は、入射媒体110より入射し、反射器100により反射され、入射媒体100から射出するような構成になっている。反射器100と誘導吸収体105の間隔Tが可変となっておりこの間隔を変更することで光学

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特性を変化させることができる。

【０００３】誘導吸収体105を構成する膜104、106、108はたとえば、二酸化ジルコニウム、タングステン、２酸化シリコンとすることが開示されている。間隔Tを変化させるための構造としては、図７のような誘電体膜と金属膜にて構成されるMEMS(micro electric mechanical system)構造が採用されている。反射鏡は、静電気により非常に高速に駆動され、光変調を行うことができる。図９から図１２までは、スペーサとの間隔が異なる場合の光学特性の変化である。各図とも縦軸が反射率、横軸が波長である。図９は、スペーサの間隔がある値Tblackの時に示す光学特性であり、図に示したように反射率が可視光域全般にわたって低い状態である。この場合、“黒”を表示している。図１０－図１２は、それぞれ間隔Tがそれぞれある値のときの特性であり、それぞれ青、緑、赤を表示することが出来る間隔TB、TG、TRである。誘電吸収体の一例によれば、TG>TB> TR>Tblackである。こうした構造を２次元的に配置し、制御することでカラーの画像を表示することができる。反射器100の駆動には、たとえば静電力が使われる。このため、非常に高速の動作ができる。画像表示の階調性の表現にあたっては、あるエリア内の反射率の高い状態の画素の割合を変える面積階調、あるいは、高速で動作できることを利用した時分割の階調表現を利用することができる。

【０００４】

【発明が解決しようとする課題】しかし、前述した干渉性変調（IMOD)素子を、ある光源により適切に照明して、その画像をスクリーン上に形成するような場合、明るい画像を得ようとすると、黒の表示時に大きな光の吸収が起こるため表示素子自体の発熱が問題となる。

【０００５】そこで、本発明は、IMOD素子の発熱を低減するとともに、そのIMOD素子を使用して、輝度の高い画像投影装置を提供することを課題としている。

【０００６】

【課題を解決するための手段】上記の課題を解決するための本発明のIMOD素子は、絶縁体層と金属層を複数透明基板上に積層した光共振層を含む光入射部と、可動反射鏡とを、対峙させた干渉性変調（IMOD）素子であって、前記IMOD素子に伝熱体を配置している。

【０００７】これによりIMOD素子に熱が放熱されるようになり、破損などの問題が軽減される。また、放熱するための構造を設けるため、開口効率が低下するためIMOD素子を１次元の画像を表示する構造としている。

【０００８】加えて、２次元の画像を得るために、光学的に１次元の画像と垂直に走査するための手段を設けている。

【０００９】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態について説明する。

【００１０】図１は、第１実施他形態のIMOD素子の１つ

の画素構造近傍の主要構造を示したものである。実際の素子としては、この構造を多数有することになる。１は、基板ガラスをあらわしており、入射光はこの基板ガラスを透過する。４，６，８はそれぞれ、誘電体あるいは金属の薄膜であり、これらの厚みを適切に選ぶことで光の共振層５を形成している。

【００１１】２は反射器であり、図示しない駆動構造に共振層と反射器２の間隔Tが変化する。このTを変化させることにより、光の吸収と反射の特性が変化し、光を変調し、画像を表示することが可能である。反射光は、入射光と逆にガラス基板１より射出していく。間隔Tを制御し光を吸収させると、反射率が低くなり画像としては“黒”を表示するようになる。このとき、光の吸収が起こるので、素子が発熱する。特に積極的に素子を照明して、明るい画像を得るような場合、この熱が大きく問題となる。このため、光の共振層５の熱を伝導しやすいような伝熱体７を、共振層５の側面に設けている。さらに図示しない表示装置の放熱手段３とこの伝熱体７を機械的に接続している。

【００１２】この構造により、熱が発生してもIMOD素子の温度上昇を抑えることが可能となる。

【００１３】伝熱体７については、金属などの伝導性のよいものであれば、同様の効果が得られ、その種類についてはとくに限定しない。又、伝熱体７は、主として共振層５中の金属等の伝導層に接触していればよい。

【００１４】基板ガラス１については、耐熱性を有することがのぞましい。

【００１５】図２には、本実施他形態の別様態を示す。同じ符号のものは同じ機能を表すものとして、説明を省略する。図１については、ある画素構造について示したが、図２では、基板ガラス１や伝熱体７が、各画素9a,9b,9cに対して共通に取り付けられている。これによって、基板構造が簡素になる。

【００１６】基本的に伝熱体７を共振層５の側面に配置したことにより、表示素子における開口効率は低下しているが、１次元構造としたことにより、開口効率の低下を抑えることができる。また、各画素の駆動用の回路なども、画素構造の側面に配置することが可能となる。

【００１７】本実施他形態においては、１つの共振層５に伝熱体７を配置する場合を示したが、これに限定するものではない。たとえば、面積階調を行う場合など、ある１つの画素として同時に駆動されるエリアの共振層５に対して共通の伝熱体を設けても良い。

【００１８】次に、第２の実施他形態について説明する。

【００１９】図３は、伝熱体７を有するIMOD素子を１次元配列して、２次元の大画面を得ることが可能な投射型の表示機器の構成を示したものである。この投影装置は、紙面垂直方向に画素列を有するIMOD素子10の画像をスクリーン12上に拡大投影し画素列と直交する方向に走査することにより２次元の画像を得るものである。

【００２０】照明光学系14は光源と光量均一化手段などから構成され、光源像を走査手段13の近傍に形成する。照明光は投射光学系11の一部11aを介して、略並行にIMOD素子を照明する。IMOD素子からの光は、光学系11aを介して走査手段13aにあたる。光走査手段13aは、IMOD素子からの光については反射するように構成されており、スクリーン12の方に光路を偏向する働きを有する。さらに投射光学系のもう一部11bを介して、IMOD素子の像をスクリーン上に結像する。光走査手段13は、IMOD素子の画素列と平行に回転軸を有しており、回転することが可能となっている。これによりスクリーン上を走査でき、結果として２次元の画像を得ることができる。また、IMOD10には、伝熱体が設けられ、その伝熱体は、装置の放熱手段3と接続されている。これにより、照明光学系14からの光がIMOD素子10で吸収されても、温度上昇を低くすることが可能となる。

【００２１】次に、照明光学系14と、IMOD素子10と光学系11aの構成について説明する。

【００２２】図４は、画素列に対して垂直な方向からの断面の概略を示している。IMOD素子10は、紙面内に画素列を有する。

【００２３】照明光学系14からの光は、前述したように光走査手段13の近傍に光源像15aを形成する。この光源像15aの位置は、本図の断面に対して光学系11aの前側焦点面付近にあり、IMOD素子10を図４の断面では、略平行光で照明する。光源像15aの位置は、光学系11aに対してオフセットしているので、IMOD素子に対して、斜めに入射するように構成されている。IMOD素子10からの反射光は、この構成により15aとは異なった15bの位置に再度光源像を形成する。

【００２４】光学系の構成から、光源像15aとは、光学的に対称な位置である。この第２の光源像15bを光走査手段13で走査することになる。

【００２５】図５は、光走査手段13aの構成を示したものである。図４に示したように、照明光学系14からの光は、透過し、IMOD素子10からの光は走査するために反射する必要がある。従って、光走査手段は、２つの領域13R，13Tに分かれており、13Rは、光を走査するために反射する領域、13Tは透過あるいは空洞となっており通過するようになっている。

【００２６】投射光学系11に対して、光走査手段13は、瞳近傍に設けられおり、図５のように走査手段13を構成することにより瞳分割して照明、投影の光路を分離することができる。白色光により照明し、IMOD素子の特性を高速に変化させることで、カラー画像を表示することが可能である。また、階調性に関しては、面積階調でおこなってもよいし、より高速に画素を駆動することで、時分割で行ってよい。図６は、本実施他形態の別様態である。同じ符号のものは、同じ機能を表すものとして、説

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明は省略する。図６で、16は色合成分離手段であり、例えば、ダイクロイックプリズムが用いられる。

【００２７】照明光学系１４から出射した白色光は、光学系11aを介して、波長領域ごとの光変調を行うIMOD素子10a、10b、10cに各波長領域ごとに対応するように色合成分離光学系16で分離される。各IMOD素子10a、10b、10cからの光は色分離合成光学系16で合成され、光走査手段13を介して、スクリーン12上を走査され２次元のカラー画像を表示する。色分離合成光学系および光源の特性、種類については、公知のものがいずれも好適に用いられる。走査手段13、各IMOD素子は、表示すべき画像信号に対して、同期が取られ、所望の画像が得られるように電気的に制御される。２次元のカラー表示に用いられる各IMOD素子は、強い照明により発生する熱を放熱できるように、伝熱体7が設けられ、さらに、放熱手段3が接続されているので、スクリーン上に明るい画像を表示することができ、又、長時間使用してもIMOD素子の劣化は小さい。又、本発明では、光源を白色光源としたが、単色光源を複数組み合わせるものであってもよい。

【００２８】

【発明の効果】以上説明した本発明によれば、干渉性変調（IMOD)素子に伝熱体と放熱手段を配置することで温度上昇を低減させることができる。またさらに、伝熱体を側面に有するような１次元配列のIMOD素子で、投射型表示装置を実現することができる。

【図面の簡単な説明】

【図１】本発明にかかる第１実施他形態の概略図

【図２】本発明にかかる第１実施他形態の別様態の概略＊図

＊図

【図３】本発明にかかる第２実施他形態の構成図

【図４】第２実施他形態の照明光学系の構成図

【図５】走査手段の構成図

【図６】第２実施他形態の別様態

【図７】干渉型反射型表示装置の構成図

【図８】反射器の構成図

【図９】干渉型反射型表示装置の特性

【図１０】干渉型反射型表示装置の特性

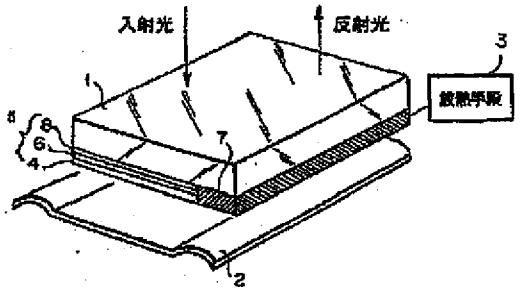
【図１１】干渉型反射型表示装置の特性

【図１２】干渉型反射型表示装置の特性

【符号の説明】

１　基板ガラス
２　反射器
３　放熱手段
４　薄膜
５　光共振層
６　薄膜
７　伝熱体部
８　薄膜
９　画素
１０　１次元配列の干渉性変調（IMOD）素子
１１　投射光学系
１２　スクリーン
１３　走査手段
１４　照明光学系
１５　光源像
１６　色合成分離手段

【図１】



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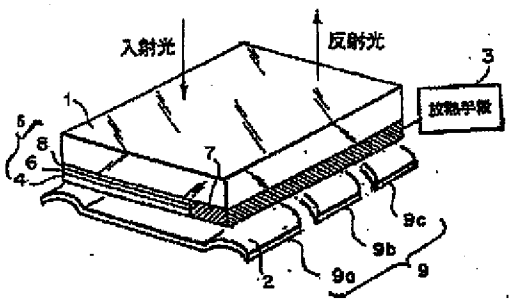

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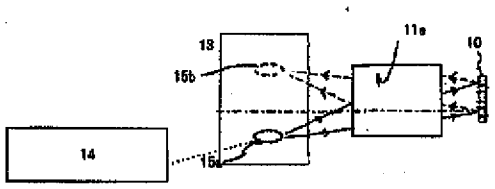

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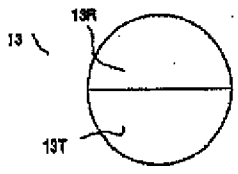

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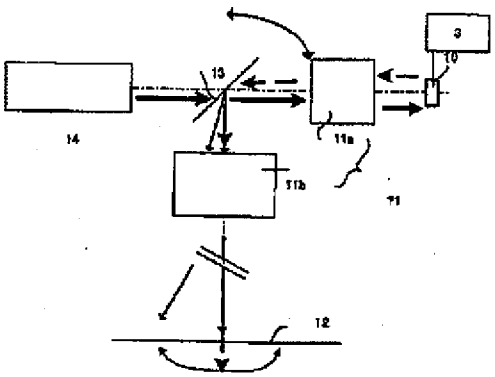

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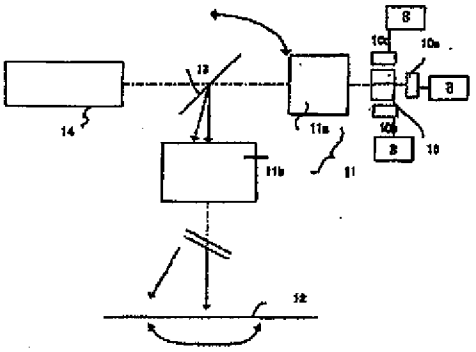

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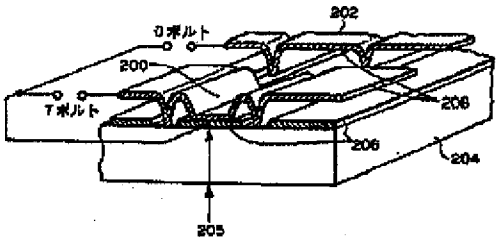

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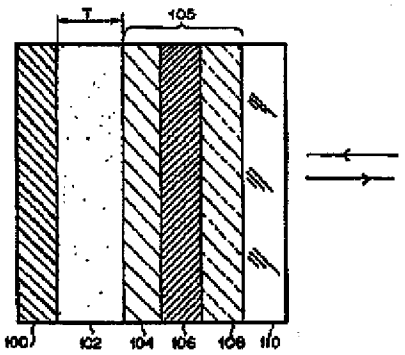

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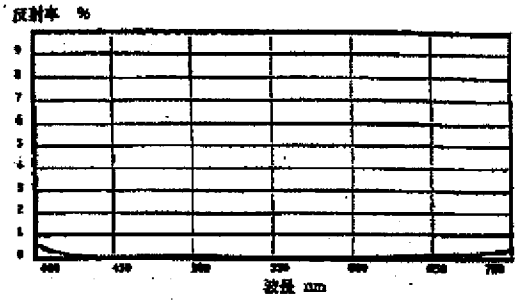

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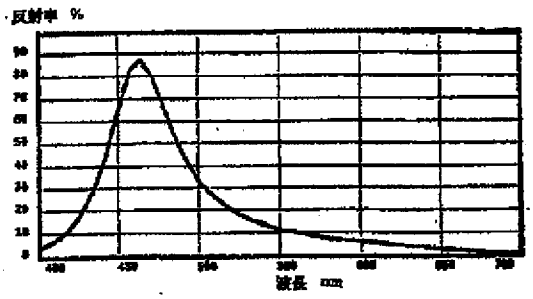
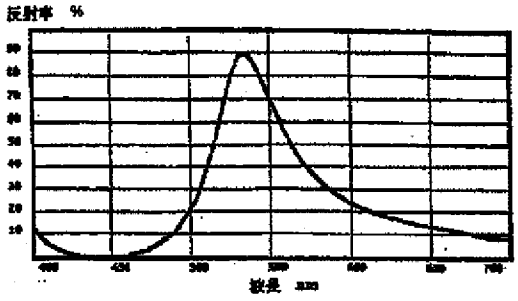


【図１１】



【図１２】